

REMARKS

Claims 1-20 were pending in the application. By this amendment a required drawing amendment is submitted, the Abstract is being amended as required, and new claims 21-39 are being submitted to advance the prosecution of the application. Marked up versions of the replacement paragraph of the specification are attached hereto pursuant to 37 C.F.R. § 1.121(c)(ii). No new matter is involved.

In paragraph 2 on page 2 of the Office Action, the drawings are objected to because the reference character "11S" is different from what is referred to at lines 5 and 7 of page 15 of the specification. In reviewing the drawings, Applicant has noted that the reference character "11S" appears in Fig. 2A and not in Fig. 1. Therefore, although the Office Action refers to Fig. 1, Fig. 2A is being amended to change the reference character "11S" to "11s" in order to correspond to the description at lines 5 and 7 of page 15. A Drawing Amendment requesting this change is enclosed, and approval thereof is respectfully requested.

In paragraph 3 on page on page 2 of the Office Action, the Abstract is objected to because of the use of reference numbers without figure numbers for the drawings. To resolve this problem, Applicant is amending the Abstract to remove all of the reference characters. Therefore, the Abstract should now be in acceptable form.

In paragraph 4 which begins on page 2 of the Office Action, claims 1, 2 5 and 6 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 5,945,972 of Okumura et al. In paragraph 5 on page 4 of the Office Action, claims 7, 8, 18 and 19 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Okumura et al. in view of EP4,144,780 of Hamada. In paragraph 6 which begins on page 5 of the Office Action, claims 3, 4 and 9-20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Okumura et al. in view of Sato et al. and further in view of EP586,155 of Yutaka et al. These rejections are respectfully traversed.

Addressing first the rejection of claims 1, 2, 5 and 6 as being anticipated by Okumura et al., a review of such reference shows that it discloses structure comprised of a first memory for an object image in a second memory for a background image (Fig. 3), wherein the first memory is used when an object is in the pixel and the second memory is used after the object leaves the pixel (Fig. 4). With respect to the memory, a DRAM type memory which uses a storage capacitor is disclosed in Fig. 8 and an SRAM type memory is disclosed in Fig. 9. It is clear from Figs. 8 and 9 of Okumura et al. that an output from the memory is directly supplied to the liquid crystal CEL via transistors 232 and 233. Therefore, in Okumura et al., the output of the memory is fixed to an upper power supply voltage or a lower power supply voltage depending on the input data to the memory, and cannot be arbitrarily set.

In contrast, claim 1 of the present application includes "a signal selector for selecting a signal for display based on the digital signal stored at said storing circuit". As shown in Fig. 2 of the present application, a signal selector 120 which is switched on and off based on the output from the memory selects one of a signal A and a signal B and supplies the selected signal to the liquid crystal. The signals A and B may each be set to an arbitrary voltage, or, alternatively, may be set as inverted AC voltages. Okumura et al. does not disclose or suggest such a structure. In a liquid crystal display device, for example, the liquid crystal is AC driven. Therefore, with a structure as shown in Fig. 8 or Fig. 9 of Okumura et al., in which the output of the memory is fixed at a power supply voltage, the input to the memory must be periodically changed. With the structure defined in claim 1 of the present application, on the other hand, it is possible to use AC signals as the display signals to be supplied to the signal selector as required, to obviate this requirement. This is also true of claim 8 of the present application. Therefore, claim 1 is submitted to clearly distinguish patentably over the art.

Claim 2, which depends from claim 1, includes a predetermined number of storing elements, with the number corresponding to the number of bits. Okumura

fails to disclose a memory having a predetermined number of elements corresponding to multiple bits. Although Okumura discloses, in Fig. 5 thereof, provision of m memories, this structure corresponds to the case where the number of types of data to be stored is m . More specifically, the data are background (white) and object (black) and the plurality of memories do not correspond to the number of bits.

Claim 6, which depends from claim 1, defines display apparatus in which operation of the driving circuits is stopped after a still image is written. Okumura includes two types of memories, one for background and the other for an object. The selection of either the first memory or the second memory differs for each pixel. As such, pixels using the first memory and pixels using the second memory are both present on one screen. As previously described, liquid crystal devices normally required AC driving. Therefore, in a structure such as that of Okumura in which the output of the memory is determined to be either an H level or an L level based on input data to the memory, the input data to the memory must be inverted regardless of whether or not the image to be displayed is a still image. In other words, with the structure of Okumura, it is virtually impossible to stop the operations of elements 230a, 230b, 276, etc., of Fig. 9 as pointed out in the Office Action. In addition, the driving circuits set forth in claim 6 comprise a circuit separate from the circuits constituting a pixel. Therefore, stopping of operations of elements 230a, etc., of Fig. 9 as noted in the Office Action, completely differs from stopping of the driving circuits in the structure of claim 6 of the present application. Such circuits cannot be compared. Therefore, claim 6 is submitted to clearly distinguish patentably over the art.

Regarding rejection of claims 7, 8 18 and 19 on the combination of Okumura and Hamada, claims 8 and 19 define that a voltage signal selected by an output from the storing circuit is an AC current oscillating around the voltage of the storage capacitor. As described in Okumura, the output from the first memory or from the second memory is directly supplied to the liquid crystal. Therefore, it is

not clear how an AC signal is supplied to the electrode by combining Hamada with Okumura. Claims 8 and 19 are submitted to clearly distinguish patentably over the art.

Regarding the rejection of claims 3, 4 and 9-20 on the combination of Okumura, Sato and Yutaka, it should be noted that claims 9 and 20 are independent claims which define a first display circuit having a storing circuit for storing a digital image signal and a second display circuit having a storing capacitor for storing an analog image signal. In Okumura, two types of memories have different functions depending on the content within one screen such as the background and object. Because pixels using the first memory and pixels using the second memory are both present in one screen, it is very difficult to divide, process, and supply a signal such that one is an analog signal and the other is a digital signal. Moreover, there is no need for such a configuration in the operations of Okumura. In the case of the present invention, on the other hand, a structure is provided which can switch between a mode to display a motion image and a mode to display a still image and it is possible to switch data such as the use of analog data for display of a motion image and the use of digital data for display of a still image. Therefore, suitable data can be used for each type of image and the power consumption when displaying a still image can be further reduced. Although, the individual structure for the memories may be known, setting only one or two types of memories in Okumura to be a memory for storing analog signals is not a simple task. Therefore, claims 9 and 20 are submitted to clearly distinguish patentably over the references.

Regarding claim 13, because of the number of storing elements corresponds to the number as bits in a manner similar to claim 2, claim 13 clearly distinguishes patentably over the art.

With respect to claim 17, because the operation of the driving circuit is stopped in a fashion similar to that defined in claim 6, claim 17 is also submitted to clearly distinguish patentably over the art.

Dependent claims 3-5, 7 and 10-18 depend, directly or indirectly, from one of independent claims 1 and 9 so as to contain all of the limitations thereof as well as additional limitations set forth by such claims. Therefore, such claims are submitted to clearly distinguish patentably over the art.

New claim 21, which depends from claim 9, is similar to claim 10 but adds the further limitations "said display circuit selector is switched in response to a switching signal," and "said switching signal is a signal common to a plurality of pixels". Therefore, such claim is also submitted to clearly distinguish patentably over the art.

New claim 22 is similar to claim 9. As such, it defines in combination "a display apparatus comprising a plurality of display pixels, wherein each of said display pixels comprises: a pixel electrode, a first storing circuit for storing digital data and outputting signals to said pixel electrode; a second storing circuit for storing analog data and outputting signals to said pixel electrode; and a storing circuit selector for switching between said first and second storing circuits". Therefore, new claim 22 is submitted to clearly distinguish patentably over the art.

New claims 23-27 are similar to claims 2, 3, 5, 6 and 7 but depend from new claim 22. Consequently, such claims are also submitted to clearly distinguish patentably over the art.

New claim 28 is similar to claim 1 but also incorporates an element of claim 9. As such, it defines display apparatus comprising "a plurality of display pixels". Each of said display pixels is defined as comprising "a pixel electrode; a first storing circuit for storing digital data; a signal selector for selecting a signal for display from among a plurality of signals based on an output of said first storing circuit and for outputting the selected display signal for said pixel electrodes; a second storing circuit for storing analog data and for directly outputting the analog data to said pixel electrodes; and a storing circuit selector for switching between

said first and second storing circuits". Therefore, new claim 28 is submitted to clearly distinguish patentably over the art.

New claims 29-33 are similar to claims 2, 3, 5, 6 and 7 but depend from new claim 28. Therefore, such claims are also submitted to clearly distinguish patentably over the art.

New claim 34 is similar to claims 9 and 10 and further defines the first storing circuit and the second storing circuit as being used in all of the display pixels. As such, claim 34 defines a display apparatus comprising a plurality of display pixels. Each of the display pixels is defined as comprising "a pixel electrode; a first storing circuit for storing digital data; a second storing circuit for storing analog data; and a memory selector for switching a digital display mode in which said first storing circuit is used in all of said display pixels and an analog display mode in which said second storing circuit is used in all of said display pixels". Therefore, new claim 34 is submitted to clearly distinguish patentably over the art.

New claims 35-39 are similar to claims 2, 3, 5, 6, and 7 but depend from new claim 34. Therefore, such claims are also submitted to clearly distinguish patentably over the art.

In conclusion, claims 1-39 are submitted to clearly distinguish patentably over the prior art for the reasons discussed above. Therefore, reconsideration and allowance are respectfully requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles telephone number (213) 337-6846 to discuss the steps necessary for placing the application in condition for allowance.

If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,

HOGAN & HARTSON L.L.P.

Date: February 10, 2003

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Version with markings to show changes made:



IN THE SPECIFICATION:

Please rewrite the Abstract Of The Disclosure as follows:

ABSTRACT OF THE DISCLOSURE

A plurality of gate lines [(51)] connected to a gate driver [(50)] for supplying gate signals and a plurality of drain lines [(61)] connected to a drain driver [(60)] for supplying drain signals are provided on a substrate [(10)]. Pixels [(200)] are formed in the regions surrounded by these lines. Each of the pixels [(200)] includes a TFT [(70)], a storing circuit [(110)] connected to the source [(11s)] of the TFT [(70)] for storing a digital signal, and a signal selector [(120)] for selecting a signal A or signal B in response to the signal stored in the storing circuit [(110)] and supplying the selected signal to a display electrode [(80)]. Once a digital signal corresponding to a display image is written to the storing circuit [(110)] of each pixel [(200)], an image can be continuously displayed, even when operation of the drivers [(50, 60)] is stopped from the next frame, by continuing the operation of the storing circuit [(110)]. Because the driver operation or the like can be suspended, overall power consumption can be reduced.